- Measures have been taken, by the Utah Department of Health, Bureau of Health Promotions, to ensure no conflict of interest in this activity.
  - ➤ CNE/CEU's are available for this live webinar. You must take the pre and post tests. 80% is required on the post test to receive CNE/CEU's.
  - Certificates will be emailed out to you within two weeks

# Evidence-Based Nutrition Practice Guidelines and

**Nutrition Recommendations** 

for Adults

with Type 1 and Type 2 Diabetes

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#### **Learning Objectives**

- 1. Name the 3 primary clinical outcomes (goals) for diabetes MNT and the current target values.
- Explain the latest nutrition intervention recommendations to normalize HbA1c in patients with type 1 and type 2 diabetes.
- Explain the latest nutrition intervention recommendations to normalize blood pressure in patients with type 1 and type 2 diabetes.
- 4. Explain the latest nutrition intervention recommendations to normalize blood lipids in patients with type 1 and type 2 diabetes.

#### Main References and Symbols in Slides

Academy of Nutrition and Dietetics
 Diabetes Nutrition Practice Guideline
 (NPG), 2008\*



Academy of Nutrition and Dietetic
 Evidence Analysis Library, Executive
 Summary, Disorders Lipid Metabolism, 2011\*



Standards of Medical Care in Diabetes, 2015\*, Amer. Diab. Assoc.



Nutrition Therapy Recommendations for the Management of Adults With Diabetes, Alison B. Evert, MS, RD, CDE, et al Diabetes Care, Nov. 2013\* vol. 36 no. 11 3821-3842

\*Date of last update when accessed online on May 1, 2015



### Recommendations: Medical Nutrition Therapy (MNT)

- ➤ Individuals who have prediabetes or diabetes should receive individualized MNT as needed to achieve treatment goals, preferably provided by a registered dietitian familiar with the components of diabetes MNT (A)
- Because MNT can result in cost-savings and improved outcomes (B), MNT should be adequately covered by insurance and other payers (E)





### Recommendations: Diabetes Self-Management Education, Support

- People with diabetes should receive DSME according to National Standards for Diabetes Self-Management Education and Support at diagnosis and as needed thereafter (B)
- Effective self-management, quality of life are key outcomes of DSME; should be measured, monitored as part of care (C)
- DSME should address psychosocial issues, since emotional well-being is associated with positive outcomes (C)





### Objective 3: Change the System of Care

- Most successful practices have an institutional priority for providing high quality of care
  - Basing care on evidence-based guidelines
  - Expanding the role of teams and staff
  - Redesigning the processes of care
  - Implementing electronic health record tools
  - Activating and educating patients
  - Identifying and/or developing community resources and public policy that supports healthy lifestyles
  - Alterations in reimbursement



## What is an Evidence-Based Nutrition Practice Guideline?

Series of guiding statements and treatment algorithms developed using systematic process for identifying, analyzing and synthesizing scientific evidence.

Assist practitioner's and patient's decisions about appropriate nutrition care for specific disease states or conditions in typical settings.

#### NPGs and Nutrition Care Process (NCP)

- Nutrition Care Process is framework for NPG:
  - Nutrition Assessment
  - Nutrition Diagnosis
  - Nutrition Interventions
  - Monitoring and Evaluation
    - Of outcomes
      - Knowledge, skill, behavior, clinical, costsavings, quality of life, satisfaction (pecking order!)

#### Rating System

#### Each Recommendation rated as:

- Strong
- Fair
- Weak
- Consensus
- Insufficient Evidence



#### Each Recommendation Statement is:

- Conditional
  - Applies to specific circumstances or sub-population (if - then scenario)
- Imperative
  - Applies to target population (required, must, should)



#### **Target Population for Diabetes NPG**

#### Adults with type 1 and type 2 diabetes:

- Adult (19 to 44 yrs)
- Middle Age (45 to 64 yrs)
- Aged (65 to 79 yrs)
- Male and female



## MNT Spelled Backwards = TNM <u>Total Nutrition Makeover</u>

**M**anaging and

Maintaining a nutrition

**M**akeover

Means

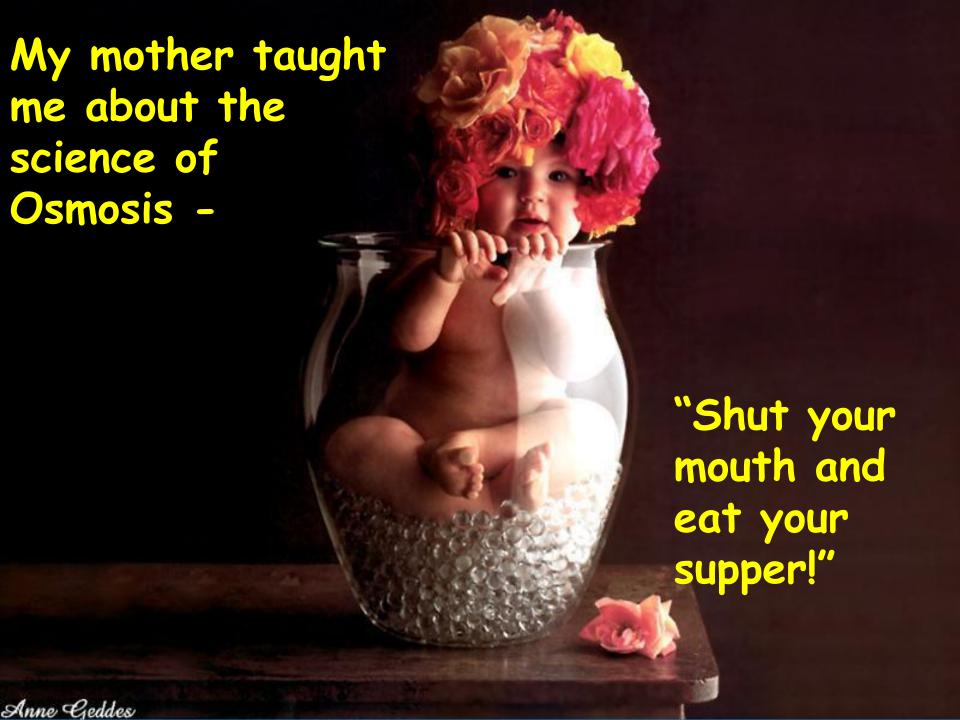
Modifying behaviors, which

Means

More than 1 visit over several

**M**onths







#### MNT Goals for Adult Patients with Diabetes

GOALS	TARGET	
A1c	<7%	
Pre-Meal	80 – 130 mg/dL	
Blood pressure	<140/90 mmHg	
LDL -C	<100 mg/dL	
Triglycerides	<150 mg/dL	
HDL-C	>40 mg/dL for men, >50 mg/dL for women	
Body weight	Achieve and maintain goals	
Diabetes complications	Delay or prevent complications	

#### **GOALS, Continued**

- Address individual nutrition needs based on:
  - Personal and cultural preferences
  - Health literacy and numeracy
  - Access to healthful food choices
  - Willingness
  - Ability to make behavioral changes
  - Barriers to change
- Maintain pleasure of eating by:
  - Providing positive messages about food choices
  - Limiting food choices only per scientific evidence
- Provide practical tools for day-to-day meal planning rather focusing on individual:
  - Macronutrients (carb, protein, fat)
  - Micronutrients
  - Single foods

#### A1C ~ "Average Glucose"

A1C	eAG		
<u>%</u>	mg/dL	mmol/L	
6	126	7.0	
6.5	140	7.8	
7	154	8.6	
7.5	169	9.4	
8	183	10.1	
8.5	197	10.9	
9	212	11.8	
9.5	226	12.6	

$$eAg = (28.7 \times A1C) - 46.7$$

**American Diabetes Association** 



#### Diagnosing Diabetes, 2015



	Normal	Pre-Diabetes	Diabetes
FPG	< 100 mg	100 – 125 mg Impaired Fasting Glucose	≥ 126 mg*
Random Plasma Glucose			≥ 200 mg w/ symptoms of high BG
2 hr OGTT (plasma) 75 g glucose in water	< 140 mg	140 – 199 mg Impaired Glucose Tolerance	≥ 200 mg*
A1C	< 5.7%	5.7% to 6.4%	≥ 6.5%*

<sup>\*</sup>In absence of unequivocal hyperglycemia, test to be confirmed by repeat testing.

Standards of Medical Care in Diabetes, Diabetes Care 2015



**BG Control** 

Plasma FG

**Total Chol** 

A1c

Lipids

LDL

TG

HDL

BP

 $0.25 - 2.9\% \downarrow$ 

24 - 32 mg (10 - 13%) \( \brace \)

15 - 25 mg (12 - 16%) \( \psi \)

No exercise:3 mg (7%) ↓

But with exercise: no 1

5 mm ↓ in systolic

2 mm ↓ in diastolic

15 - 17 mg (8%) ↓

50 - 100 mg ↓

#### Effectiveness of Diabetes MNT

6 wks to 3 months

6 wks; if goals not met,

Measured at every visit

intensify MNT, check in 6 wks

	diabetes		
Indicat	or	<b>Expected Outcome</b>	When to Evaluate

## Diabetes NPG Addresses 6 Key Components for Control of "A-B-C's" of Diabetes:

<u>A</u>1C

**B**lood Pressure

**C**holesterol

How? S.W.E.E.T.S. for L.I.F.E.

#### S.W.E.E.T.S. are Your Diabetes L.I.F.E.savers

- **S** = **S**tress Control
- W = Weight Control
- **E** = **E**at Healthy
- E = Exercise
- T = Take Diabetes Meds, If Required
- \$ = Self-monitor blood glucose

#### for

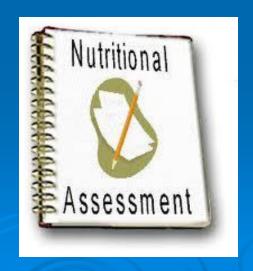
- L = Learn to Reduce Risks
- Invest in Long-Term Support
- F = Fix Your Problems
- **E** = **E**njoy Adequate Sleep



MNT wrapped around, and spelled backwards, is

Total Nutrition Makeover

# Nutrition Assessment: 1<sup>st</sup> Step in Nutrition Care Process





#### **Diabetes Nutrition Assessment Matrix**

Food,	Biochemical	Anthro-	Physical	Client
Nutrition and	Data, Medical	pometric	Exam	History
Exercise	Tests,	Measure-	Findings	
History	Procedures	ments		
Food with	Lab data	Ht, wt, BMI,	Oral health,	Meds, use of
focus on carb,	(electrolytes,	growth rate,	physical	supplements,
nutrient intake,	BG, BP,	and rate of	appearance,	medical and
nutrition related	lipids), tests	wt change	muscle and	health history,
knowledge,	(gastric		subcutaneous	social
practices,	emptying		fat, wasting,	personal and
physical	time, resting		and mental	family history
activity, food	metabolic		status	
availability	rate)			

#### **Assessment to Include Waist Circumference Measurement and Evaluation:**

CVD DISeas	e Risk Associated with Bivil + Waist Size
RMI	CVD Risk per Waist:

men, ≥ 35 

<18.5 **Underwt** N/A

18.5 - 24.9 **Normal** N/A

25.0 - 29.9 **Overwt** High

30.0 - 34.9 Very High Obese

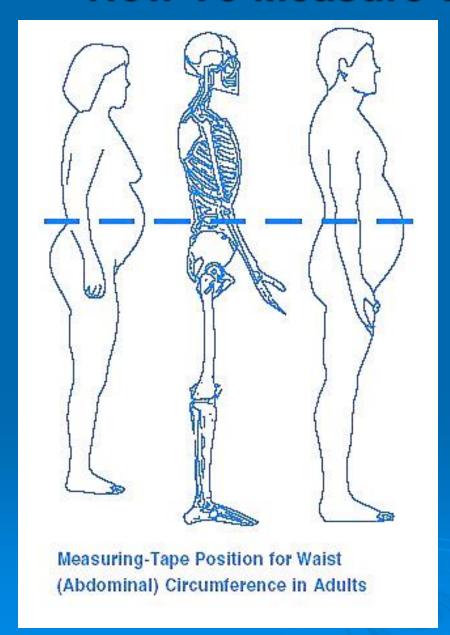
35.0 - 39.9 Obese Very High

**>40 Extremely Extremely High** Obese

http://www.consumer.gov/weightloss/bmi.htm

Obese Asian Americans cutpoints for prediabetes and type 2 diabetes:			
BMI			
≥23 kg/m2	Overwt or obese		

#### **How To Measure Waist Circumference**



With arms straight down, measure at elbow joint.

Source:
Nutrition Care Manual, 2015
Academy of Nutrition and Dietetics

#### Also Include Waist-to-Hip Ratio

#### Waist and Waist to Hip Ratio Chart: Risk of CVD and Obesity-Related Diseases

MALE	FEMALE	Health Risk Based Solely on Waist and WHR
Waist: >40"	Waist: >35"	At Risk
WHR: 0.95 or below	WHR: 0.80 or below	Low Risk
WHR: 0.96 to 1.0	WHR: 0.81 to 0.85	Moderate Risk
WHR: 1.0+	WHR: 0.85+	High Risk

#### Strong, Imperative



# Nutrition Diagnosis: 2<sup>nd</sup> Step in Nutrition Care Process





# Nutrition Intervention: 3rd Step in Nutrition Care Process

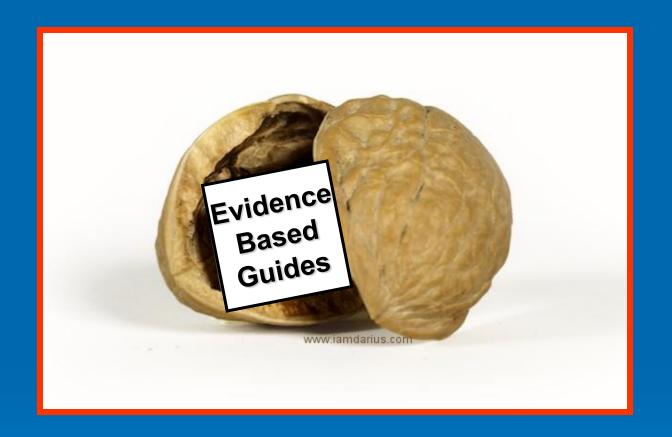


Evidence-Based Interventions to Improve BG, Lipids, BP and Reduce Cardiometabolic Risk (CMR) in Adult Patients with Type 1, Type 2 Diabetes are Summarized in:

A. D.I.A.B.E.T.E.S.

M.E.A.L. P.L.A.N.

#### Let's Examine in a Nutshell



## Lots more details follow in slides after nutshell summary

A = Avoid sugar-sweetened beverages (BG, CMR)



D = Divide daily calories into ≥3 moderate meals or ≥4 smaller meals (BG)

I = Increase plant stanols and sterols,1.6 - 3 g/day (Lipids)



I = Improve portion control for BG control, weight loss and weight maintenance. A = Arrange meal plan/eating pattern that fits pt's personal preferences, goals, etc.

Appreciate that there is:

- No "one-size-fits-all" eating pattern
- Many acceptable eating patterns exist:
  - Mediterranean-style, MUFA-rich eating pattern can improve BG, CVD risk
    - Can be recommended as effective alternative to *lower fat, higher-carb plan*

B = Boost total fiber and viscous soluble fiber to 7 - 13 g/day (Lipids)



- $\mathbf{\Xi} = \mathbf{\Xi}$ nsure calorie intake  $\mathbf{\Psi}$ , if overwt.
  - Ensure intake of plant + marine omega 3 fats from foods (Lipids, CMR)
  - Encourage intake of n3 fish, 2 3x/week
    (Lipids, CMR)
- T = Trim sodium to <2300 mg/day (BP); DASH Diet = 1500 – 2400 mg/day

#### Viscous soluble dietary fiber

FOOD SOURCE	VISCOUS SOLUBLE FIBER(G) <sup>1</sup>	TOTAL DIETARY FIBER (G)
Fruit (1 medium)		
Apple	1	4
Banana	1	3
Blackberries (1/2 c)	1	4
Nectarine	1	2
Citrus fruit	1	2-3
(orange, grapefruit)		
Peach	1	2
Pears	2	4
Plums	1	1.5
Prunes	1.5	4

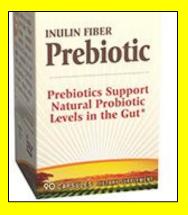
#### Viscous soluble dietary fiber

FOOD SOURCE	VISCOUS SOLUBLE FIBER(G) <sup>1</sup>	DIETARY FIBER (G)
Seeds Psyllium seeds, ground (1 tbsp)	5	6

> Inulin

Viscous soluble dietary fiber...added to foods...in

capsules





- Naturally occurring carb (oligosaccharide, in group of carbs called fructans) from chicory root
  - Does not break down into glucose like other carbs
  - Does not affect BG level (minimal glycemic effect)
- Passes into large intestine; prebiotic that feeds gut bacteria and fermented by, producing friendly acids\*

- > Inulin
  - Benefits:
    - Viscous soluble fiber:
      - ↓ blood cholesterol and LDL-C
      - ↓ post-meal BG
    - Prebiotic: may ↓ post-meal BG via acids that are produced when fermented by gut bacteria\*
    - Excellent sugar replacer due to:
      - Sweet taste (30-50% as sweet as sucrose)
      - Bulking properties of real sugar

- E = Ensure meal plan meets recommended daily allowance/dietary reference intake for all micronutrients (CMR)
- S = Shrink saturated fat to <5% of calories/day and trans fats to 0 g/day (BG, Lipids, CMR)
  - Due to √ research in area, PWD to follow Dietary Guidelines for Americans, 2010:

    - $\blacksquare$   $\Psi$  dietary cholesterol to 300 mg/day
    - Limit trans fat as much as possible



s = Substitute low-glycemic load foods for higher-glycemic load foods (BG)

- S = Shrink high sucrose foods to avoid displacing nutrient-rich foods (BG)
- M = Make alcohol intake moderate (≤1 drink/day for women; ≤2 for men)

M = Make at least half of all grains whole grains

- Ensure intake of antioxidant-rich fruits, veggies, whole grains (not supplements) (CMR)
  - Oxidation reactions produce free radicals which
     ⇒ oxidative stress (esp. CV system) ⇒ cell
     damage ⇒ pre-mature aging
  - High BG ⇒ glucose toxicity ⇒ glucose oxidation ⇒ free radical production ⇒ cell damage, incl. pancreatic beta cell damage/destruction
  - Dietary antioxidants that inhibit oxidation: vitamin A, C, E, beta carotene, lycopene, lutein, polyphenols, CoQ10, selenium, flavonoids, flavones, flavonols, proanthocyanidins, green tea

- E = Encourage high omega 3 (n3) fatty fish to 2 3 x/week + plant-based fatty acids
  - Supplementation to be based on status of:
    - o CHD
    - Angina
    - Implantable cardioverter defibrillator/ICD

Patients
without
documented
CHD

Eat variety of (preferably fatty) fish at least twice a week. Include oils and foods rich in alpha-linolenic acid (flaxseed, canola and soybean oils; flaxseed and walnuts).

Patients
with
documented
CHD

Consume about 1 g of EPA + DHA/day, preferably from fatty fish. EPA+DHA in capsule form could be considered in consultation with the physician.

Patients who need to triglycerides

2 - 4 g of EPA + DHA/day provided as capsules under physician's care.

A = Assure consistent timing and even spacing of meals and carbohydrate intake

- A = Assure priority given to coordinating food with type of diabetes medicine
  - If on insulin secretagogues, eat moderate amounts of carb at meals and snacks.

- L = Learn to monitor carbohydrate intake: amount individualized to meet BG targets.
  - Carb foods, high carb beverages and endogenous insulin production are greatest determinant of post-meal BG
  - Choose nutrient-dense, high-fiber carbs instead of processed foods with added sodium, fat, and sugars.
  - Nutrient-dense foods and beverages (e.g., milk) provide vitamins, minerals and other healthful substances with less calories.

- P = Provide lean protein for health, 15-19% of calories, if no renal impairment.
  - In T2 DM: no significant effect on BG
  - In T1 DM: effect on BG is less clear
- L = Lower total fat to 20 35% of calories to ↓ CVD risk, CMR, obesity (per IOM)



L = Let fat quality be more important than quantity; replace SFA with MUFA, PUFA (BG, Lipids)

- A = Allow non-nutritive sweeteners (NNSs) as they can  $\psi$  calorie and carbohydrate intake if substituted for caloric sweeteners.
- N = Nibble on nuts, 5 oz./week, especially walnuts, pecans, almonds, pistachios (Lipids, CMR)



N = Notify non-insulin pts it is not necessary to subtract amount of dietary fiber or sugar alcohols from total carbohydrates when carbohydrate counting.



### Weight Management

Assess relative importance of weight management for overweight and obese diabetes pts

Studies show that sustained wt loss interventions lasting ≥ 1 yr had <u>inconsistent</u> effects on A1C, even though modest wt loss shown to improve insulin resistance in overweight and obese insulin-resistant persons.

**Strong and Conditional** 

### Why?<sup>1</sup>

- 1. Calorie deficit during wt loss results in BG improvement almost immediately and before wt loss occurs, resulting in better A1c
  - In wt maintenance phase, calorie deficit eliminated
  - Bariatric surgery; BG improves quickly before weight loss
    - Improvement may result from nutrients diverted away from GI tract and incompletely digested nutrients to ileum
  - 1. The Dilemma of Weight Loss in Diabetes, Franz Marion J. MS, RD, LD, CDE, Diabetes Spectrum July '07 vol. 20 no. 3 133-136

- **2.** In early stages of T2, insulin resistance is *predominant* metabolic error....not insulin deficiency
  - Calorie deficit ↓ BG almost immediately in resistant phase
  - When T2 progresses from insulin resistance TO insulin deficiency, BG benefits of calorie deficit and wt loss ↓
  - Treatment focus in insulin deficiency stage of T2:
    - Prevent weight gain
    - Combine meds (also insulin) with MNT
    - Seek glycemic control over weight control
      - Control requires key interventions working together:
        - Healthy eating, exercise, meds, stress control

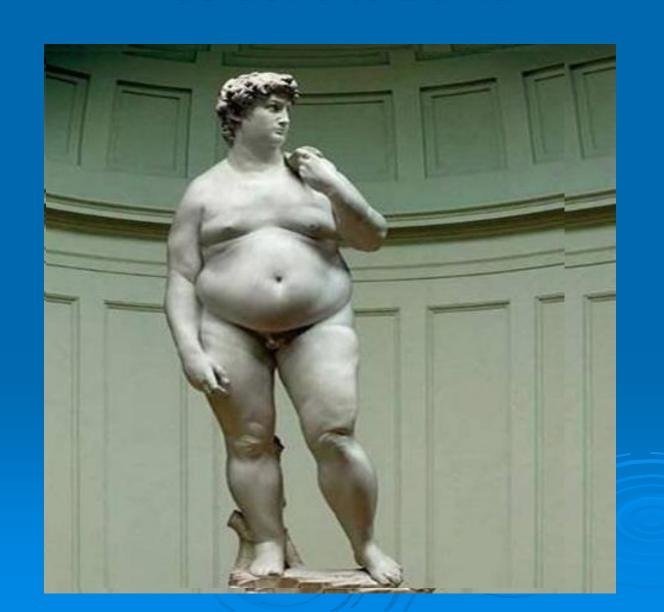
### THE BOTTOM LINE

Eating less calories and getting regular physical activity improves BG control independent of body weight and weight loss.

# After 2 year loan to United States, Michelangelo's David being returned to Italy



# Look at what excess calories and no exercise has done to David!



So what ARE the key, appropriate messages concerning weight loss for people with diabetes?



#### > Set realistic weight goals

- Unrealistic wt goal is strong predictor of wt loss failure (4)
- Majority can expect to lose 5–10% of starting wt
- Successful long-term wt management requires ↓ in calories, exercise, and behavioral modification
- When wt loss plateaus, encourage same lifestyle strategies that led to wt loss to prevent wt regain
- Are no magical diets or specific foods to eat
- (4) Grave RD, Calugi S, Molinari E, Petroni ML, Bondi M, Compare A, Narchesini G, the QUOVADIS Study Group: Weight loss expectations in obese patients and treatment attrition: an observational multicenter study. *Obes Res* **13**:1961 –1969,2005

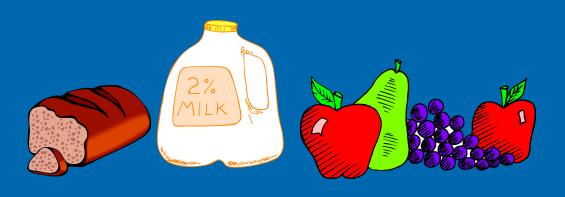
#### Encourage regular physical activity

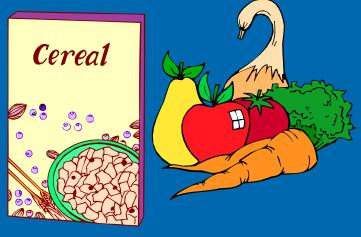
- BG benefits of fitness are independent of wt loss
- Low cardio-respiratory fitness and physical inactivity shown to be independent predictors of all-cause mortality in men with type 2 diabetes regardless of their weight (2)
- Even increased BMI did not 1 mortality risk in fit men with T2 diabetes (3)

<sup>(2)</sup> Wei M, Gibbons LW, Kampert JB, Nicaman MZ, Blair SN: Low cardio-respiratory fitness and physical activity as predictors of mortality in men with type 2 diabetes. *Ann Intern Med* **132**:605 –611, 2000

<sup>(3)</sup> Church TS, Cheng YJ, Earnest CP, Barlow CE, Gibbons LW, Priest EL, Blair SN: Exercise capacity and body composition as predictors of mortality among men with diabetes. *Diabetes Care* **27**:83 –88, 2004

#### > Eat healthful diet

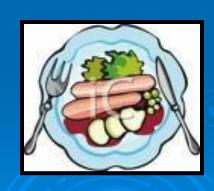




Keep combined food and BG records to optimize BG control so that medication can be added or adjusted when needed



- Variety of eating patterns acceptable
- Pt's plan determined by assessment of:
  - Personal factors: tradition, culture, religion, etc.
  - Economics
  - Co-morbid conditions
  - Lab values and metabolic goals
  - Medications
  - Physical activity



- Psychosocial factors
  - Patient's wishes...paramount!
  - Willingness and ability to follow meal plan
  - Appetite
  - Preferred foods
  - Usual eating habits
  - Daily schedule, family concerns, etc.
- Maintaining pleasure of eating by only limiting food choices when indicated by scientific evidence



#### > Options

- Dietary Guidelines for Americans and RDAs
- Plate Method
- MyPyramid (food guidance system by USDA)
- Glycemic Index + Load (Carb "Quality" + Quantity)
- Choose Your Foods: Exchange Lists for Diabetes



#### Options

 Mediterranean-style, MUFA-rich eating pattern may benefit glycemic control and CVD risk factors and can therefore be recommended as effective alternative to a lower-fat, higher carbohydrate eating pattern



### > Options

- Vegetarian, vegan
- Low fat
- Low carbohydrate
- DASH diet

- > Options:
  - Individualized carb counting:
    - Basic
    - Advanced (insulin:carb ratio for pt)
    - Estimated average carb amount based on:
      - Gender
      - Weight goal: to lose or control weight
      - Active patients



# Estimating Average Carb Amount\* per Gender, Weight Goal and Activity

	To Lose Wt: Carb Servings Per Meal	To Control Wt: Carb Servings Per Meal	Active Pts: Carb Servings Per Meal
Women	3-4 (45-60 g)	4-5 (60-75 g)	5-6 (75-90 g)
Men	4-5 (60-75 g)	5-6 (75-90 g)	6-7 (90-105 g)

<sup>\*</sup> NOT individually determined per pt's weight, wt goal, and BG targets

### > Options:

- Simplified approaches:
  - The First Step in Diabetes Meal Planning
  - Healthy Food Choices
  - Eating Healthy With Diabetes: Easy Reading Guide
  - Healthy Eating for People with Diabetes



### **Carbohydrate Monitoring**

- Monitoring carb intake is key strategy in achieving glycemic control whether by:
  - Carb counting
  - Food exchanges
  - Experienced-based estimation
  - Other meal planning systems

But should pt's monitoring of carb intake be done separately from BS monitoring?



### **Carbohydrate Monitoring**

15 g carb = 1 carb serving, choice, exchange

**Exchanges** = Carbohydrate Choices

2 starch = 2 carb choices

1 fruit = 1 carb choice

1 milk = 1 carb choice

3 meat = 0 carb choice

2 fat = 0 carb choice

#### **Example:**

- Breakfast: 3 carb choices = 45 grams
- Lunch: 2 carb choices = 30 grams
- Snack: 1 carb choice = 15 grams
- Dinner: 3 carb choices = 45 grams
- Evening Snack: 1 carb choice = 15 grams

#### Diet to include healthier carbs:

- Fruits
- Vegetables
- Whole grains
- Lentils and legumes
- Low-fat dairy



#### **Advanced Carb Counting**

- Equivalent to using insulin-to-carb ratio when on basalbolus insulin therapy
  - Ratio = # units insulin to cover x gm carbs eaten at meal
  - Ratio can be same for all 3 meals or not
  - Individualized for pt, based on total daily dose of insulin (basal + bolus/mealtime insulin) using

**500 RULE: 500 ÷ TTD** 

Ex:  $500 \div 50 = 10 \text{ g carb}$ 

Ratio = 1 unit bolus insulin given for every 10 g carb or 6 units insulin for every 60 g carb



#### **Macronutrients in Meal Plan**

Research does <u>NOT</u> support *ideal* % of calories from macronutrients: carbohydrate, protein, fat

- > % based on individualized needs:
  - Eating patterns, preferences, metabolic goals, etc.
- Encourage consumption based on *Dietary Reference* Intakes (DRI) for healthy adults

Strong, Imperative



#### **Macronutrients in Meal Plan**

- Metabolic goals include (not limited to):
  - Weight
  - BG
  - Lipids
  - BP
  - GFR
  - etc.



Do you have any questions for me before we move on?





# Carbohydrate Amount to be Individualized, Per Review of:

- Individualized clinical goals:
  - Weight
  - BMI goal
  - Lab values (esp. pre- and post-meal BG)
- > Other clinical and nutritional factors:
  - Co-morbidities
  - Meds (integrated into pt's lifestyle, not reverse)



## **Consistent Carbohydrate Intake**

- > For pts on:
  - MNT alone; see slide 68; will MNT now be alone?
  - MNT + glucose-lowering medications or
  - MNT + fixed insulin doses

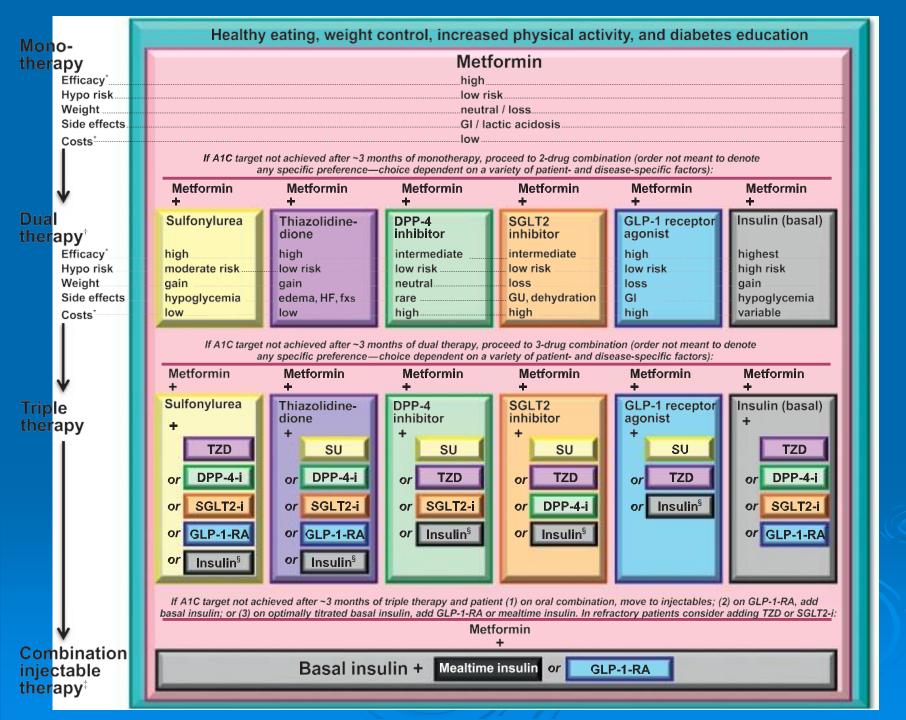
Meal and snack carb intake to be kept consistent on day-to-day basis.

Consistency in carb intake results in improved glycemic control.

Strong, Conditional

## Algorithm for Management of Type 2 Diabetes

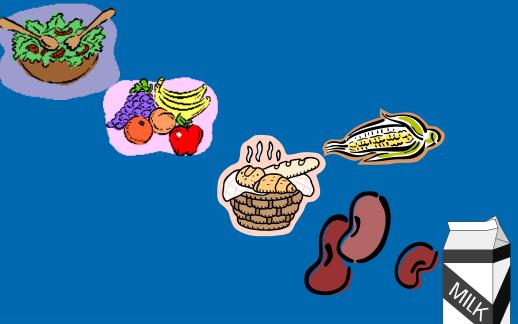
Standards of Medical Care in Diabetes, *Diabetes Care* 2015





## **Choose HEALTHY Carb for Good Health**

- Vegetables
- Fruits
- Whole grains
- Legumes
- Dairy products



- Instead of carb foods containing:
  - Added fats, sugars or sodium







### Carbohydrate Intake: MDI Patients

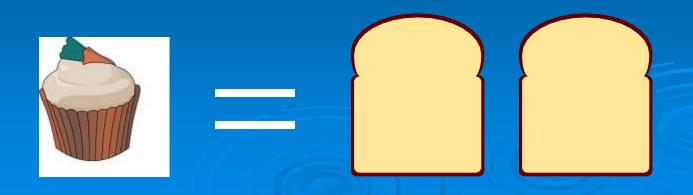
- > For pts on multiple daily insulin injections:
  - Meal/snack carb intake need NOT be consistent
  - Insulin dose adjusted to match carb intake, using insulin-to-carb ratio

- Pre-meal insulin dose based on planned carb intake and pre-meal BG level
  - Intake can vary meal-to-meal and day-to-day
  - BG control + quality of life improved without adverse effects

# Carbohydrate Intrinsic Factors DO Affect Glycemic Response

1 frosted cupcake = 2 slices bread in grams carbohydrate: 30 g

But what is in cupcake that will cause BG response to be different than that of 2 slices of bread?





## Glycemic Index (GI) of Food

- Compares postprandial BG increases to constant amounts of different carb foods (how high BG rises)
- Is increase above FBS in BG area 2 hr after eating constant amount of tested food (50 gm carb) divided by response to reference food (glucose or white bread: GI = 71)

Low GI food = <55

Medium GI food = 55 - 69

High GI food  $= \ge 70$ 





Conflicting evidence of '
 effectiveness as meal plan
 strategy

High vs. low GI diets report
 mixed effects on A1C

Fair, Conditional

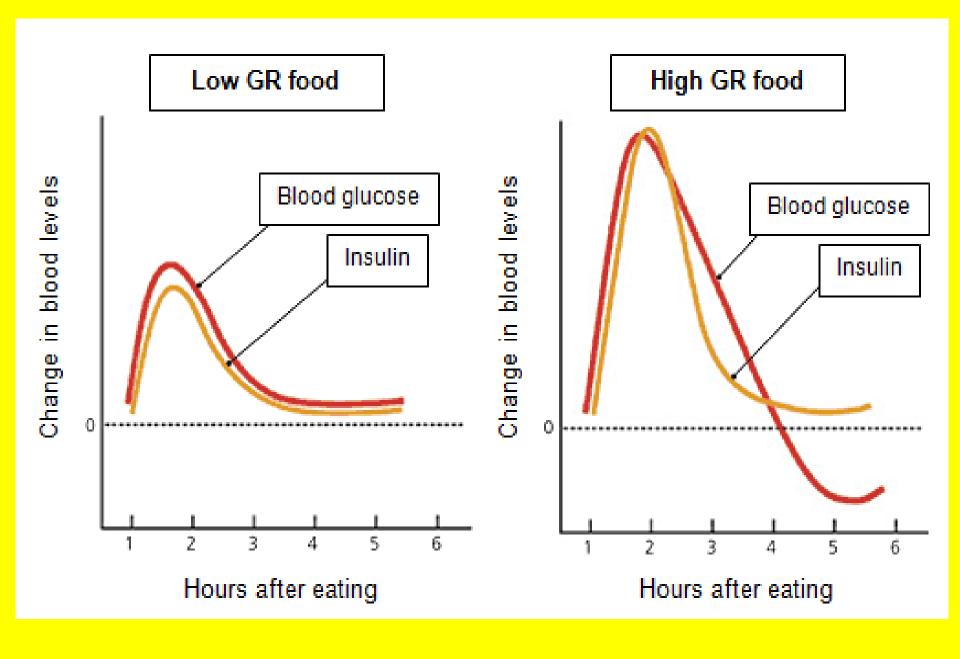
Glycemic index and glycemic load may provide modest additional benefit for glycemic control over that observed when total carbohydrate considered alone



### **Glycemic Index**

- Measures how high BG rises after carb eaten
  - Low GI carbs produce only small rise in BG
  - High GI carbs produce larger rise in BG
- Does NOT measure how rapidly BG levels 1
- Non-carb foods (meat, fish, eggs, avocado, wine, beer, spirits, most vegetables) do NOT have GI value.

No Carbs = No GI Value



### **Factors Affecting Glycemic Index**

- Fiber content
- Type of carbohydrate (molecular structure)
- Type of starch
  - Amylose: hard to digest tightly packed starch granules
  - Amylopectin: easier to digest loosely packed starch granules
- Ripeness (raw bananas and potatoes more resistant to digestion in small intestine than ripe)
- > Raw (more resistant to digestion) vs. cooked starch food
- Cooking method: amount of heat and moisture used
- Cooking time
- Food processing

#### **High GI Foods**

- Breakfast cereals
- Instant rice, instant mashed potatoes
- > Pretzels
- Watermelon
- Honey
- White bread

#### **Low GI Foods**

- Legumes, beans, lentils
- Grapefruit, apple, orange
- Oats, barley, bulgur wheat
- Basmati rice
- Pasta
- Whole milk
- Snicker's bar
- Ice cream, yogurt
- Apples, oranges

## Glycemic Load: GL

- Ranking of rise in BG based on BOTH:
  - GI of food AND amount of carb eaten
- Combines "quality" + "quantity" of carb in one number:

GI x amount carb gm eaten (less fiber) ÷ 100

Low GL

=<10

Medium GL

= 10 - 19

High GL

 $= \ge 20$ 

Food	GI	Carb gm eaten less fiber	GL
Capellini pasta, cooked	45 low	45 g	20 high
Watermelon	72 high	6 g	4 low
Low GI food	= <55		

**Medium GI food** = 55 - 69

**High GI food**  $= \ge 70$ 

> Low GL **Medium GL** High GL

=<10

= 10 - 19

= <u>></u>20

## If you do eat <u>small</u> amount of <u>high GI</u> food like **WATERMELON**, you still can get a lower GL!

GI = 76 (high)
Carb in 1 cup = 11 gm
Dietary fiber = 0.6 gm

GL = Gl x amount carb gm eaten (less fiber) ÷ 100

 $76 \times 11 \div 100 = 8.36 \text{ (low GL)}$ 

# But if you eat <u>large</u> amount of **WATERMELON**, you will get a high GL!

GI = 76 (high)
Carb in 4 cups = 44 gm
Dietary fiber = 2.4 gm

GL = Gl x amount carb gm eaten (less fiber) ÷ 100

 $76 \times 41.6 \div 100 = 31$  (high GL)

#### **BUT.....**

See how you can eat <u>large</u> amount of <u>low GI</u> food like <u>BOILED CARROTS</u>, and still get low GL!

GI = 39 (low)

Carb in 1 cup = 8 gm; dietary fiber = 5.22 g

Carb in 4 cups = 32 gm

Dietary fiber = 20.88 gm

GL = Gl x amount carb gm eaten (less fiber) ÷ 100

 $76 \times 11.12 \div 100 = 8.45 \text{ (low GL)}$ 



#### **Bottom Line: Gl and GL**

GI alone or GL alone NOT to be only used meal planning system used

Why?

Initial focus to be on total carb eaten

 GI and GL can be used to help pts understand WHY carb counting alone may NOT always be perfect My mother taught me about the science of Osmosis -

"Shut your mouth and eat your supper!"





## **Spacing of Meals**

- > MNT as monotherapy (BUT is it ever alone?)
  - 3 moderate meals or 4 smaller meals
- Snacks based on pt's schedule and preferences
- > MNT with oral anti-diabetes agents:
  - Moderate to small in size
  - Snacks NOT needed unless risk of low BG
  - Maintain consistent timing of meals and carbs



## **Spacing of Meals**

- > MNT with insulin:
  - Keep meals moderate to small in size
  - Patients on fixed insulin regimens:
    - Emphasize consistency in
      - Meal timing and carb intake
  - Pts on intensive (flexible) insulin regimens:
    - ID pre-meal insulin doses based on:
      - Planned amount of carb to be eaten
      - > Pre-meal BG level



## Protein Intake with Normal Renal Function

- Acute effect on insulin secretion BUT usual protein intake has minimal effect on:
  - BG
  - Lipids (if *lean* protein chosen)



- With normal renal function, provide usual protein intake for health: ~ 15 to 20% of calories
- Does NOT significantly slow absorption of carbohydrate food
- Adding protein NOT shown to treat or prevent low BG!



## Classifying Overweight and Obesity by BMI, Waist Circumference and Associated CVD Risk

	BMI	Obesity Class	CVD Risk Rating: WC: Men ≥ 40" WC: Women ≥ 35"
Underweight	< 18.5		
Normal	18.5 to 24.9		
Overweight	25 to 29.9		High
Obesity	30 to 34.9	I	Very High
Obesity	35 to 39.9	IJ	Very High
<b>Extreme Obesity</b>	<u>≥</u> 40		Extremely High



## Vitamins, Minerals, Antioxidants

- No clear evidence of benefit from supplementation in diabetes persons without deficiencies
- Supplementation with antioxidants (vitamins E, C, b-carotene and selenium) NOT advised, per study<sup>1</sup>
- MULTI-VITAMINS
- Efficacy and long-term evidence safety not clear
- ↓ Rx niacin's ability to ↑ HDL in study
- Chromium supplementation benefit NOT clearly demonstrated; cannot be recommended
- 1. Atherosclerosis and Lipoproteins: Antioxidant Supplements Block the Response of HDL to Simvastatin-Niacin Therapy in Patients With Coronary Artery Disease and Low HDL, Marian C. Cheung, Xue-Qiao Zhao, Alan Chait, John J. Albers, B. Greg Brown, Arteriosclerosis, Thrombosis, and Vascular Biology. 2001; 21: 1320-1326, http://atvb.ahajournals.org/content/21/8/1320.short

#### **Statin and Niacin Combination**

Combination statin therapy with niacin is not recommended given the lack of efficacy on major CVD outcomes, possible increase in risk of ischemic stroke, and side effects.



## Sucrose: Sugar is NOT the Enemy!

- Sucrose-containing foods to be substituted for other carb foods in meal/snack
- Intakes of 10 35% of total cal:
  - Do NOT↑BG or lipids when substituted for isocaloric amounts of other carbs
  - Will NOT aggravate hyperglycemia
- Fat ingested with sucrose (ice cream!) will ↑ calories
- Most high sugar foods low in other healthful nutrients

- Sugar and carbohydrate counting:
  - Must ignore grams of sugar on Nutrition Facts
     label
  - Sugar included in total grams carbohydrate
    - Includes BOTH:
      - Added sugar
      - Natural sugars in foods





## **Fructose-Containing Foods**

- Sucrose + high-fructose corn syrup rapidly absorbable
- Sugar-sweetened beverages (SSB) are high in
- ▶ Large amount of SSBs to be avoided to ↓ risk for:
  - Weight gain
  - Cardiometabolic risk factors
  - Particularly adverse effects on selective deposition of ectopic and visceral fat, lipid metabolism, BP, insulin sensitivity, and de novo lipogenesis, compared with glucose-sweetened beverages



#### **Non-Nutritive Sweeteners**

- For FDA-approved non-nutritive sweeteners, at levels that do not exceed ADIs (Acceptable Daily Intakes) RD to advise pt that:
  - Some may contain call and carbohydrate from other sources that need to be accounted for
- Research on non-nutritive sweeteners reports NO effect on changes in glycemic response

## Some Sugar Substitutes Have Calories

- Non-nutritive (calorie-free)
  - Aspartame (Equal®, NutraSweet®)
  - Saccharine (Sweet 'N Low®, Sugar Twin®)
  - Sucralose (Splenda®)
  - Acesulfame K (Sweet One®)
- Nutritive (2 cal/gm)
  - Sugar alcohols (sorbitol, mannitol, xylitol)
  - Fructose

## Sugar Alcohol and Carb Counting

Carb counting: subtract  $\frac{1}{2}$  of sugar alcohol on label when  $\geq 5$  g

Example: 6 pieces sugar-free candy

Sugar Alcohol = 10 g

- = 30 g total carbohydrate
  - 5 g sugar alcohol
- = 25 g carb to count

Most appropriate for insulin-carb ratio pts

#### **Nutrition Facts**

Serving Size: About (20g) Servings Per Container: 16

	36	07200720073
	Amount	% Daily
	Per Serving	Value*
Total Calories	60	
Calories From Fat	15	
Total Fat	2 g	3%
Saturated Fat	1 g	4 96
Trans Fat	0 g	
Cholesterol	0 mg	0.96
Sodium	45 mg	2%
Total Carbohydrates	15 g	5%
Dietary Fiber	4 g	17%
Sugars	4 g	
Sugar Alcohols (Polyols)	3 g	
Protein	2 g	
Vitamin A	20	0%
Vitamin C		0.96
Calcium		296
Iron		2%

<sup>\*</sup>Percent Daily Values are based on a 2,000 calorie diet.

Ingredients: Wheat flour, unsweetened chocolate, erythritol, inulin, oat flour, cocoa powder, evaporated cane juice, whey protein concentrate, corn starch (low glycemic), natural flavors, salt, baking soda, wheat gluten, guar gum





#### **Alcohol**



- If used, intake limited to:
  - ≤1 drink/day for women....≤ 2 drinks/day for men
  - ↓ risk of CVD
- Consume with food (caution: any food?) to ↓ risk of hypoglycemia in pts using:
  - Insulin and insulin secretagogues
  - Empty stomach: 2 oz. alcohol/1-2 drinks can cause ↓ BG
- ➤ If not on Insulin/insulin secretagogues, moderate intake on empty stomach: no acute effect on BG, insulin concentration
  - ▶ BUT: carb eaten with alcohol (mixed drink) may ↑ BG



#### **General Alcohol Guidelines**

- Avoid alcohol intake on empty stomach
- Drink in moderation
- Provider may ↑ DM meds during heavy drinking
- Excess can worsen neuropathy, retinopathy, HTN, TG, pancreatitis
- Contains empty calories and can contribute to wt gain
- 1 drink or 15 g alcohol equals:
  - 1.5 oz. shot of hard liqueur and brandy
  - 5 oz. wine or 2 oz sherry
  - 12 oz. beer (preferably light to ↓ carb)



#### **Total Fiber Intake and Glycemia**

- Recommendations similar to general public
  - DRI = 14 g per 1000 kcal
- High intake 44 to 50 g day improves glycemia, but:
  - Unknown if daily amount consumable due to:
    - Limited 

       fiber choices, GI effects, palatability
- Usual fiber intake (up to 24 g daily) not shown to have beneficial effects on glycemia
- Carb from dietary fiber included in total gms carb on label

- Total fiber = combination of:
  - Insoluble at 0 kcal and 0 gm carb
    - Not digested, not absorbed



- Soluble at 1.5 to 2.5 kcal/gm
  - Some energy yielded from by-products (free fatty acids) of soluble fiber fermentation in colon
  - Free fatty acids = food for gut-friendly bacteria
- Good sources of fiber:
  - Whole grain cereals
  - Fruits
  - Vegetables
  - Beans and peas





#### Fiber and Carbohydrate Counting

## Subtract ½ of fiber on food label when dietary fiber = > 5 g

Ex: Total Fiber = 14 g

1 c. cereal = 30 g total carbohydrate

- 7 g dietary fiber

= 23 g carb to count



- Most appropriate for insulin-carb ratio pts
- "Net Carb", "Impact Carb" not defined by FDA
  - Created by co's to give products more shelf appeal



#### **Blood Glucose Monitoring (SMBG)**

- Improves BG when data used to adjust therapies
- > To do whether on MNT alone OR MNT + Rx meds
- Frequency + timing depends on:
  - Type of DM
  - Co-morbidities
  - Level of BG control
  - Diabetes meds
  - Risk of hypoglycemia
  - Physical activity
  - Pt willingness and ability

Fair, Conditional

As I do have diabetes, it's important to me, To monitor my blood sugar frequently.

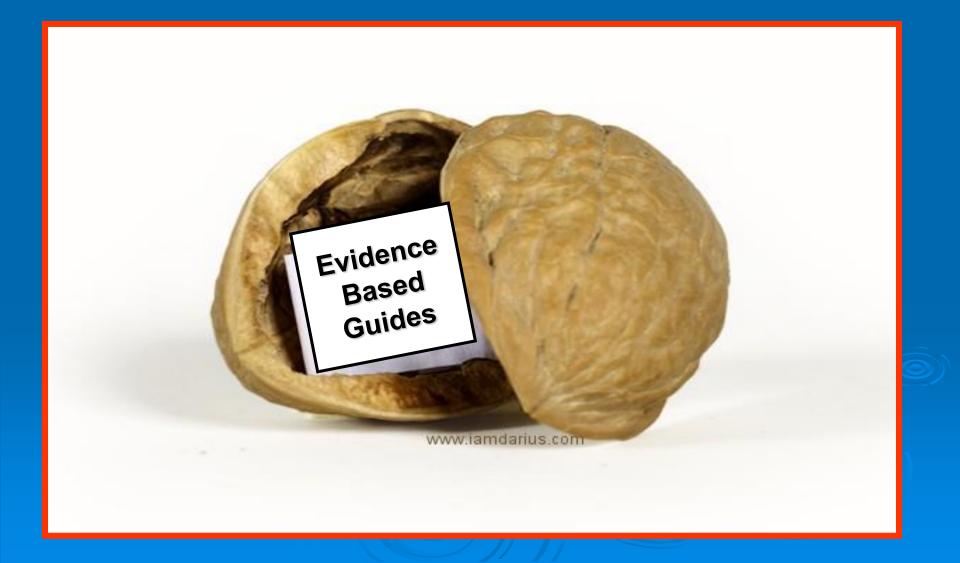
Up and down my sugars sometimes go, For sure I want to avoid a low!

Also want to know when my sugar is high, A change in medication, could be the thing to try.

If still not at target, my BG logs will be key, To help my educator and I the new plan to see.

My health and blood sugar.....so joined at the hip, The educator reviewing my logs is so worth the trip!

# Cardio-Protective Nutrition Guidelines in a Nutshell





## Cardio-Protective Nutrition for Prevention and Treatment of CVD

- Reduces CV risk and improves CV outcomes
- UGH: 2 out of 3 persons with diabetes will die from CVD!
- Implement interventions in initial series of encounters:
  - 1. ↓ saturated fat (<5% of cal/day) and ↓ *trans* fats (0 g/day)
  - 2. ↓ dietary cholesterol (<300 mg/day)
  - 3. † dietary fiber.....esp. soluble/viscous fiber, 7 13 g/day
  - 4. † plant stanols/sterols (2 -3 g/day; >3g = no extra benefit)
  - 5. † antioxidant-rich foods (not supplements)



- 6. Exercise! (>30 min. most days of week, moderate intensity)
- 7. Re-evaluate lipid meds: dosage and necessity
- 8. Achieve and maintain healthy weight
- 9. Evaluate CVD risk factors: waist circumference, WHR BMI
- 10. Limit monounsaturated fat to 20%, polyunsaturated fats, 10%
- 11. Encourage high n3 fatty fish to 2-3 x/week + plant fatty acids
- 13. Limit alcohol intake to "moderate" (1 drink/day F, 2/day Male)



14. Eat 5 oz. nuts/wk (esp. walnuts, pecans, almonds, pistachios)

#### 15. Improve BP with nutrition:

- Limit sodium to ≤2300 mg/day
- Ensure adequate intake of calcium, magnesium, potassium
- Adopt Dietary Approaches to Stop Hypertension (DASH) diet (rich in fruits, vegetables, low-fat dairy, nuts; low in sodium, total fat, saturated fat; and adequate in calories for weight management. Reduces systolic blood pressure by 8-14 mmHg
- 16. Improve BP with Rx medication, if needed (next slide)



#### **BP Goal for PWDs and HTN Treatment**

ВР	Lifestyle Therapy (LT) *	HTN Meds, ACE Inhibitor or ARBs	Thiazide or Loop Diuretic
*LT advised when BP >120/80 Goal: S: <140 D: <90	<ul> <li>DASH Diet</li> <li>↓ Na to &lt;2300 mg/day</li> <li>Weight Loss if needed</li> <li>Physical Activity</li> <li>Moderate Alcohol</li> <li>↑ Potassium</li> </ul>		
IF Not at Goal	Continue Lifestyle Therapy	ADD HTN Med(s):  If >1 med, 1 to be  ACE or ARB  (if 1 not tolerated, other to be used)	
Est GFR of <u>&gt;</u> 30	Renal MNT	(ic	ADD thiazide diuretic
Est GFR of <30	Renal MNT		ADD loop diuretic



#### **Dietary Fats and Cholesterol**

- ➤ Total fat intake: ↓ to 25 35% of calories
- > Saturated fat: <7% of calories
- > Trans fats: avoid as much as possible
- Dietary cholesterol: <200 mg/day</p>
  - **↓** LDL-C up to 16%

- Can replace saturated fat calories with:
  - Polyunsaturated fats (OK)
  - Monounsaturated fats (BEST)
  - Protein (lean)
  - Higher fiber carb <u>IF</u> carb does 
     ↓ LDL-C <u>without</u> ↓

     HDL-C or ↑TG

> Ideal %'s of carb, protein replacement unclear



### Fiber, Cholesterol and Heart Health

- Include foods containing 25 30 g TOTAL fiber/day, with special emphasis on soluble fiber sources
  - Soluble fiber goal: 7 13 g/day
  - † VISCOUS fiber to improve lipid profile
- Diets high in total fiber + soluble fiber can further ↓:
  - Total-C by 2 3%
  - LDL-C up to 7%

Strong, Imperative



### Fiber, Cholesterol and Heart Health

- As fiber 

  risk factors for CHD 

  :
  - BP
  - Lipoprotein sub-classes and particle sizes
  - Insulin resistance
  - Post-prandial BG
  - CVD (fatal and non-fatal MI, and stroke)
- ➤ Can further
  - TC by 2 3%.....LDL up to 7%

Strong, Imperative



- Omega 3 benefits to overall heart health:
  - → inflammation inside arteries and rest of body
  - At high doses, ↓ risk of abnormal heart rhythms
  - → blood triglycerides
  - → rate of plaque buildup inside blood vessels
  - Slightly ↓ blood pressure



#### AHA 2015 Recommendations n3 Fatty Acids

Patients
without
documented
CHD

Eat variety of (preferably fatty) fish at least twice a week. Include oils and foods rich in alpha-linolenic acid (flaxseed, canola and soybean oils; flaxseed and walnuts).

Patients
with
documented
CHD

Consume about 1 g of EPA+DHA per day, preferably from fatty fish. EPA+DHA in capsule form could be considered in consultation with the physician.

Patients who need to ↓
triglycerides

2 to 4 grams of EPA+DHA per day provided as capsules under a physician's care.

http://www.heart.org/HEARTORG/GettingHealthy/NutritionCenter/Fish-101\_UCM\_305986\_Article.jsp



- WITHOUT CHD: n3-rich FISH
  - 2 servings per week (3.5 4 oz. each)
    - + mercury: canned light tuna, salmon, pollock, catfish
    - Scallops, shrimp, clams, flounder, cod, sole
    - 1 mercury: swordfish, king mackerel, shark
    - n3 = DHA docosahexaenoic acid and EPA eicosapentaenoic acid
  - ❖ May/may not ↓ arrhythmia and atrial fibrillation
    Fair, Conditional



- WITHOUT CHD: n3-rich PLANT FOODS
  - Men: 1.6 g...Women: 1.1g per day (AI)
    - ALA (alpha-linoleic acid) in:
      - Flaxseed, canola, soybean oils; flaxseed, walnuts

        - Not related to other non-sudden fatal CVD events or non-fatal MI



- WITH CHD: n3-rich FISH
  - $\circ \ge 2$  servings/week (3.5 4 oz. each)
    - ullet ullet arrhythmias and fatal heart disease
    - ↓ progression of coronary atherosclerosis

Fair, Conditional



- WITH CHD: n3-rich PLANT FOODS
  - ↓ cardiac death and non-fatal MI
  - o May ↓ recurrence of MI
  - o Sources:

Fair, Conditional



#### n3 Supplements Summary

- Supplementation to be based on status of:
  - o CHD
  - Angina
  - Implantable cardioverter defibrillator (ICD)
- WITHOUT CHD: no intervention studies
- WITH CHD....but no angina, no ICD:



#### n3 Supplements Summary

- WITH CHD or angina or ICD:
  - May be contraindicated
- WITH 个 TG and no contraindications:
  - 2-4 g/day under doctor supervision to ↓ TG when
     >200 mg
  - USDA caution: >3 gm/day may cause GI symptoms

Fair, Conditional



#### n3 Supplementation

Evidence does NOT support recommending omega-3 (EPA and DHA) supplements for people with diabetes for the prevention or treatment of cardiovascular events.

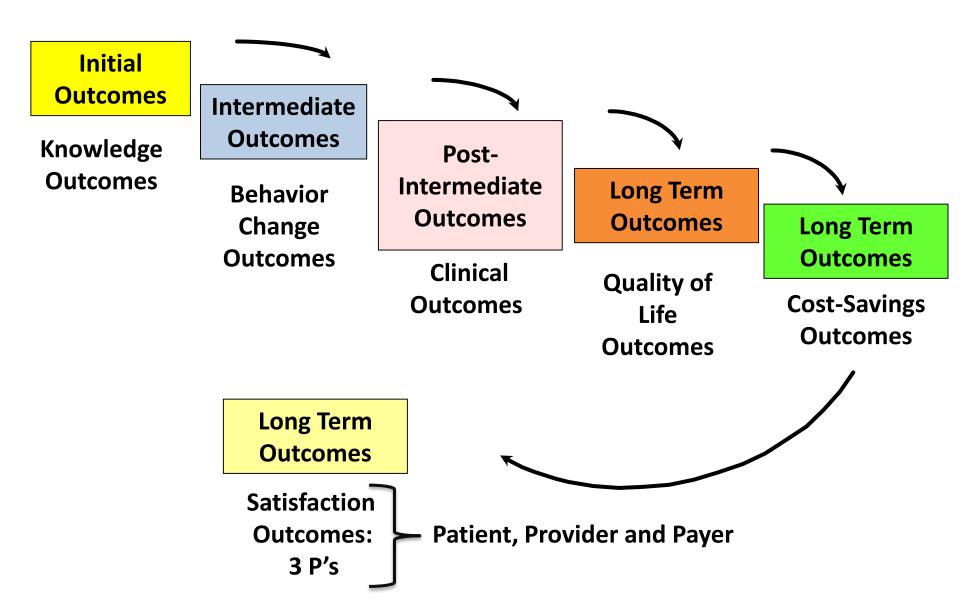
Standards of Medical Care in Diabetes, Diabetes Care 2015



Monitoring and
Evaluation:

4<sup>th</sup> Step in
Nutrition Care Process

#### **Spectrum of DSME/MNT Patient Outcome Measures**





#### **Monitoring and Evaluation**

Research reports

sustained improvements

in A1c at

≥1 year with long-term follow-up encounters with RD.



#### **Monitoring and Evaluation**

- > RD to monitor and evaluate:
  - Food intake (especially carbohydrate)
  - Medications
  - Weight, BMI, waist circumference, waist-tohip ratio
  - Physical activity
  - Knowledge and skill outcomes
  - Behavior outcomes
  - Clinical outcomes (A1c, BG, lipids, BP, etc.)
  - Quality of life and health outcomes



#### **SMBG: MDI and Pump Patients**

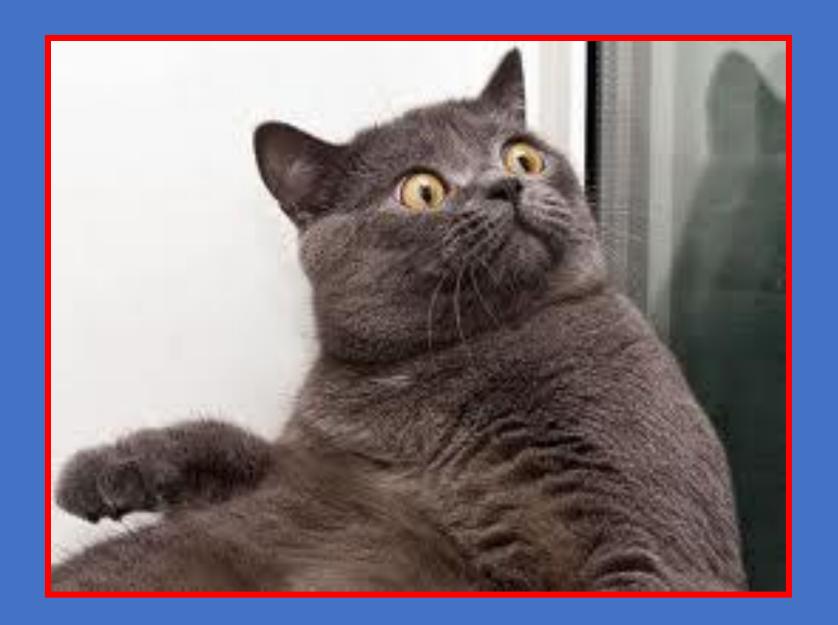
- Multiple-dose insulin (MDI) or insulin pump pts:
  - SMBG prior to meals and snacks
  - Occasionally post-prandially
  - Bedtime
  - Prior to exercise
  - When suspect low BG
  - After treating low BG until normoglycemic, and
  - Before critical tasks (e.g., driving)



### **SMBG: Other Patients with Diabetes**

SMBG results may be helpful to guide treatment decisions and/or patient self-management for patients using less frequent insulin injections or non-insulin therapies.

## You expect me to remember all this stuff?

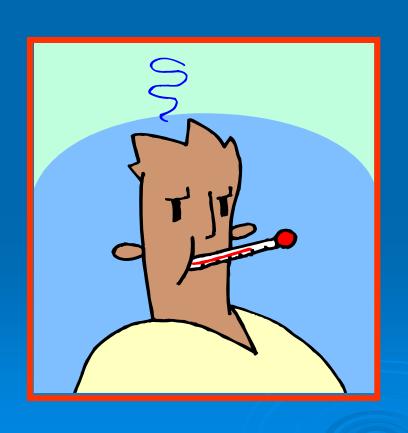


I've learned that I must learn the newest methods, processes and technologies, so that both I, and my patients, land on our feet the first time and every time!



#### **BOTTOM LINE:**

#### LIFESTYLE AFFECTS DIABETES!



"Our health always seems much more valuable after we lose it."

~Author Unknown





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#### **Resources by Mary Ann Hodorowicz**

#### Turn Key Materials for AADE DSME Program Accreditation

- DSME Program Policy & Procedure Manual Consistent with NSDSME (72 pages)
- Medicare, Medicaid and Private Payer Reimbursement
- Electronic and Copy-Ready/Modifiable Forms & Handouts
- Fun 3D Teaching Aids for AADE7 Self-Care Topics
- Complete Business Plan

#### 3-D DSME/T and Diabetes MNT Teaching Aids 'How-To-Make' Kit

Kit of 24 monographs describing how to make Mary Ann's separate 3-D teaching aids plus fun teaching points, evidence-based guidelines and references

Money Matters in MNT and DSMT: Increasing Reimbursement Success in All Practice Settings, The Complete Guide ©, 5th. Edition, 2015

#### Establishing a Successful MNT Clinic in Any Practice Setting©

#### EZ Forms for the Busy RD©: 107 total, on CD-r; Modifiable; MS Word

- Package A: Diabetes and Hyperlipidemia MNT Intervention Forms, 18 Forms
- Package B: Diabetes and Hyperlipidemia MNT Chart Audit Worksheets: 5 Forms
- Package C: MNT Surveys, Referrals, Flyer, Screening, Intake, Analysis and Other Business/Office and Record Keeping Forms: 84 Forms